TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED / ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371	ATTORNEY'S DOCKET NUMBER P67575US0 10/049638

INTERNATIONAL APPLICATION NO	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/GB00/03073	9 August 2000	24 August 1999

TITLE OF INVENTION

ACOUSTIC DEVICE

APPLICANT(S) FOR DO/EO/US

Owain Francis PEDGLEY, Robert James ARMSTRONG and Edwin William Longley NORMAN

Applicant herein submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for Internatl. Preliminary Examination was made by the 19th month from earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the Internatl. Preliminary Examination report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:

    International Search Report- EPO
    PCT/IB/304 Form
    PCT/IB/308 Form
    First Page of Publication
    International Preliminary Examination Report - with no annexes

US APPLICATION NO (If known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
10/049638	PCT/GB00/03073	P67575US0

	CALCULATIONS	PTO USE ONLY
17. ☒ The following fees are submitted:		
Basic National Fee (37 CFR 1.492(a)(1)-(5)):		
Internatl. prelim. examination fee paid to USPTO (37 CFR 1.492 (a) (1)) .. $710.00		
No international preliminary examination fee paid to USPTO (37 CFR 1.492 (a) (2)) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) .. $740.00		
Neither international preliminary examination fee (37 CFR 1.492 (a) (3)) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO) **$1040.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.492 (a) (4)) and all claims satisfied provisions of PCT Article 33(2)-(4) $100.00		
Search Report prepared by the EPO or JPO (37 CFR 1.492 (a) (5)) **$890.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 890.00	
Surcharge of $130.00 for furnishing the **oath or declaration** later than ☐ **20** ☒ **30** months from the earliest claimed priority date (37 CFR 1.492(e)).	$ 130.00	

Claims	Number Filed	Number Extra	Rate		
Total Claims	**11** - 20 =	-0-	x $18.00	$	
Independent Claims	**1** - 3 =	-0-	x $84.00	$	
Multiple Dependent Claim(s) (if applicable)			+ $280.00	$	

TOTAL OF ABOVE CALCULATIONS =	$ 1020.00	
Reduction by 1/2 for filing by **small entity**, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).	$	
SUBTOTAL =	$ 1020.00	
Processing fee of $130 for furnishing the **English translation** later than ☐ **20** ☐ **30** months from the earliest claimed priority date (37 CFR 1.492(f))	$	
TOTAL NATIONAL FEE =	$ 1020.00	
Fee of $40.00 for recording the enclosed **assignment** (37 CFR 1.21(h)). Assignment must be accompanied by appropriate cover sheet (37 CFR 3.28, 3.31).	$	
TOTAL FEES ENCLOSED =	$ 1020.00	
	Amt. to be refunded:	$
	Amt. charged:	$

a. ☒ A check in the amount of $ 1020.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. **06-1358** in the amount of $ ____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge my account any additional fees set forth in §1.492 during the pendency of this application, or credit any overpayment to Deposit Account No. **06-1358**. A duplicate copy of this sheet is enclosed.

SEND ALL CORRESPONDENCE TO:

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By Jonathan L. Scherer
Jonathan L. Scherer
Reg. No. 29,851

JPH&S 3/95

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Owain Francis PEDGLEY et al.

Serial No.: New

Filing Date: February 25, 2002

For: ACOUSTIC DEVICE

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to initial examination, please amend the above-identified application as follows:

IN THE SPECIFICATION

On page 1, immediately following the title, please insert the following sentence: --This is a nationalization of PCT/GB00/03073 filed August 9, 2000 and published in English.--

Please incorporate the new Abstract of the Disclosure into the specification, submitted herewith on a separate sheet.

IN THE CLAIMS

Please amend claims 3, 4, 6, 7 & 9 as follows:

3. (amended) An acoustic device according to claim 1, said soundboard having a cellular rigid foam structure.

4. (amended) An acoustic device according to claim 1, said

soundboard having a density of 500-700 kg/m^3.

6. (amended) An acoustic device according to claim 1, said soundboard having a tensile strength of about 20 MPa.

7. (amended) An acoustic device according to claim 1, said soundboard having a flexural strength of about 30 N/mm^2.

9. (amended) An acoustic device according to claim 1, comprising a musical instrument.

REMARKS

The foregoing Preliminary Amendment is requested in order to delete the multiple dependent claims and avoid paying the multiple dependent claims fee.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE.**"

Early action on the merits is respectfully requested.

Respectfully submitted,

JACOBSON HOLMAN PLLC

By 

Jonathan L. Scherer
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Atty. Docket: P67575US0
Date: February 25, 2002
JLS/cmf

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS

3. (amended) An acoustic device according to claim 1 [either one of the preceding claims], said soundboard having a cellular rigid foam structure.

4. (amended) An acoustic device according to claim 1 [any one of the preceding claims], said soundboard having a density of 500-700 kg/m^3.

6. (amended) An acoustic device according to claim 1 [any one of the preceding claims], said soundboard having a tensile strength of about 20 MPa.

7. (amended) An acoustic device according to claim 1 [any one of the preceding claims], said soundboard having a flexural strength of about 30 N/mm^2.

9. (amended) An acoustic device according to claim 1 [any one of the preceding claims], comprising a musical instrument.

ACOUSTIC DEVICE

The present invention concerns acoustic devices, particularly musical instruments, having a new and improved soundboard, methods of manufacture of same, and the use of specific soundboards in the manufacture of acoustic devices.

For a long time it has been desired to produce acoustic devices, particularly musical instruments such as guitars, using soundboards constructed from synthetic polymers rather than wood as is traditionally done. Such devices would be relatively simple and inexpensive to manufacture and the production of devices having reproducible acoustic properties would be reduced from the complex skill-dependent job of an artisan to a controllable manufacturing process.

There have been many attempts to produce musical instruments having synthetic polymer-based soundboards, e.g. US 4353862, US 4364990, US 4429608, US 4969381, US 4873907, US 4188850, US 4185534, US 4213370, US 4290336, US 4334452, US 5469769, US 5804746 and US 4290336.

However, such instruments have typically suffered from the problem that they have been of a complex construction (for example with soundboards requiring carbon fibre or glass fibre reinforcements), are costly to manufacture, and have a sound quality not comparable to sound produced by instruments having the traditional wooden soundboard.

The present inventors have overcome the prior art disadvantages, producing musical instruments having polymer-based soundboards which are capable of producing sound of comparable quality to that produced by wooden soundboards. The materials

used are readily available and may be used to produce any desired acoustic device having a soundboard.

According to the present invention there is provided an acoustic device having a soundboard comprising expanded polycarbonate.

The expanded polycarbonate may be provided in the form of a sheet.

The soundboard may have a cellular rigid foam structure.

The soundboard may have a density of 500-700 kg/m^3, for example 650 kg/m^3.

The soundboard may have a tensile strength of about 20 MPa.

The soundboard may have a flexural strength of about 30 N/mm^2.

One expanded polycarbonate material which is particularly useful is FOREX-EPC E 50.650 (Airex AG, Switzerland; SBA Ltd, Leicester, UK). It has a closed cell rigid foam structure, an apparent density (DIN 53479) of 650 kg/m^3, a tensile strength (DIN 53455) of 20 MPa, elongation at break (DIN 53455) of at least 10%, an E-Modulus in tension (DIN 53457) of 1000 MPa and in flexure (DIN 53457) of 1200 MPa, a flexural strength (DIN 53452) of 30 N/mm^2, is unbreakable on impact (DIN 53453), dimensional changes (DIN 16927) of ±0% at 120 minutes at 70°C, -0.5% at 75 minutes at 140°C (MD) and +0.4% at 75 minutes at 140°C (TD), and water absorption (DIN 53495) of less than 1% (W3-100°C 30 minutes).

Although it has previously been suggested in the art to use foams in the construction of e.g. guitars, it has never been suggested to use expanded polycarbonates.

For example, US 4185534 suggests using polystyrene and other homopolymers and copolymers derived from hydrocarbon vinyl monomer. Accoustic tests conducted by the inventors using an expanded PVC (Foamex - Airex AG, Switzerland; SBA Ltd, Leicester, UK) were found to produce a very "dull" sound which was unacceptable. Non-expanded polystyrene was also tested and found to produce a very "tinny" sound which was also unacceptable.

In certain of the prior art, the use of foams is disclosed but this is typically in the manufacture of solid-bodied instruments and not hollow-bodied ones having a soundboard.

It is typically found with traditional wooden instruments having a soundboard that they have "dead spots" or emit "wolf tones", which are particular frequencies that either respond very poorly or are much louder than the notes of other frequencies. This problem can be mitigated or avoided completely using the soundboards of the present invention.

The expanded polycarbonates used in the acoustic devices of the present invention have excellent acoustic properties allowing for the construction of e.g. stringed instruments such as guitars (see below) which have a quality of sound at least as good as instruments having wooden soundboards.

Naturally the exact acoustic properties of expanded polycarbonates will vary with e.g. their apparent density, tensile strength and flexural strength. Other factors such as the size of bubbles in the foam, either open or closed cells, as well as the gas or gases contained in the foam are also important. Nitrogen is typically used to expand the polycarbonate into the foam structure, but other gases may equally be used. For example, halogens such as argon, neon and helium. Other normally gaseous (under

normal atmospheric temperature and pressure) elements and compounds may also be used (subject to any undesired reactions with the polycarbonate) and will be readily apparent to one skilled in the art, for example as disclosed in e.g. US 4185534.

As well as forming the soundingboard of the acoustic device out of an expanded polycarbonate such as a polycarbonate sheet, the physical characteristics of the expanded polycarbonate may vary from point to point. For example, if the acoustic device is a guitar, the expanded polycarbonate soundboard may vary in thickness across its width or along its length. Similarly the size and/or density of bubbles may be varied.

The acoustic device may be a guitar as discussed above, or it may be any other musical instrument, particularly a stringed musical instrument, having a soundboard. For example, it may be a violin, mandolin, bass, lute, dulcimer, harp or piano.

The acoustic device may equally be any other device having a soundboard, for example devices requiring sound resonance (amplification) such as loudspeakers, drums or alarm systems.

The invention will be further apparent from the following description, with reference to the several figures of the accompanying drawings, which show, by way of example only, forms of guitar according to the present invention.

Of the Figures:

Figure 1 shows a front view of a first embodiment of a guitar;

Figure 2 shows a front view of a second embodiment of a guitar; and

Figure 3 shows a side view of the guitars in Figures 1 and 2.

Guitar 10 incorporating a soundboard according to the present invention has a general construction as shown in British Registered Designs Nos. 2074916 (guitar body) and 2074917 (guitar bridge).

Guitar 10 comprises a wooden neck 20, head 30 and fretboard 40. Soundboard 50 comprises FOREX-EPC E 50.650 having outer edge 51 and inner edge 52 defining sound-hole 53. Underside bracing of soundboard 50 is provided by a clear Lexan-polycarbonate brace 60.

Bridge 70 comprises Lexan. Sides 80 and back 90 comprise a single piece epoxy glass fibre moulding. Soundboard 50, brace 60, bridge 70 and sides 80/back 90 and bonded to gether using methylmethacrylate adhesive.

In a first embodiment of guitar 10 provided in Figure 1, a pattern construction for the main structural brace 60 is shown. Additional smaller braces (not shown) are used to distribute vibrations of the soundboard 50.

A second embodiment of the guitar 10 is provided in Figure 2. Here, brace 60 is in a slightly V-shaped pattern. The pattern of brace 60 according to this second embodiment may be more suited for production manufacture of guitar 10. In one variation (not shown) of the second embodiment, the pattern of brace 60 will be parallel rather than slightly V-shaped.

It will be appreciated that it is not intended to limit the invention to the above example only, many variations, such as might readily occur to one skilled in the art,

being possible, without departing from the scope thereof as defined by the appended claims.

CLAIMS

1. An acoustic device having a soundboard comprising expanded polycarbonate.

2. An acoustic device according to claim 1, said soundboard comprising an expanded polycarbonate sheet.

3. An acoustic device according to either one of the preceding claims, said soundboard having a cellular rigid foam structure.

4. An acoustic device according to any one of the preceding claims, said soundboard having a density of 500-700 kg/m^3.

5. An acoustic device according to claim 4, said soundboard having a density of 650 kg/m^3.

6. An acoustic device according to any one of the preceding claims, said soundboard having a tensile strength of about 20 MPa.

7. An acoustic device according to any one of the preceding claims, said soundboard having a flexural strength of about 30 N/mm^2.

8. An acoustic device according to claim 1, said soundboard comprising FOREX-EPC E 50.650.

9. An acoustic device according to any one of the preceding claims, comprising a musical instrument.

10. An acoustic device according to claim 9, comprising a stringed musical instrument.

11. An acoustic device according to claim 10, comprising a stringed musical instrument selected from the group comprising guitar, violin, mandolin, base, lute, dulcimer, harp and piano.

Abstract

The present invention concerns acoustic devices, particularly musical instruments, having a new and improved soundboard formed from expanded polycarbonate, methods of manufacture of same, and the use of specific soundboards in the manufacture of acoustic devices.

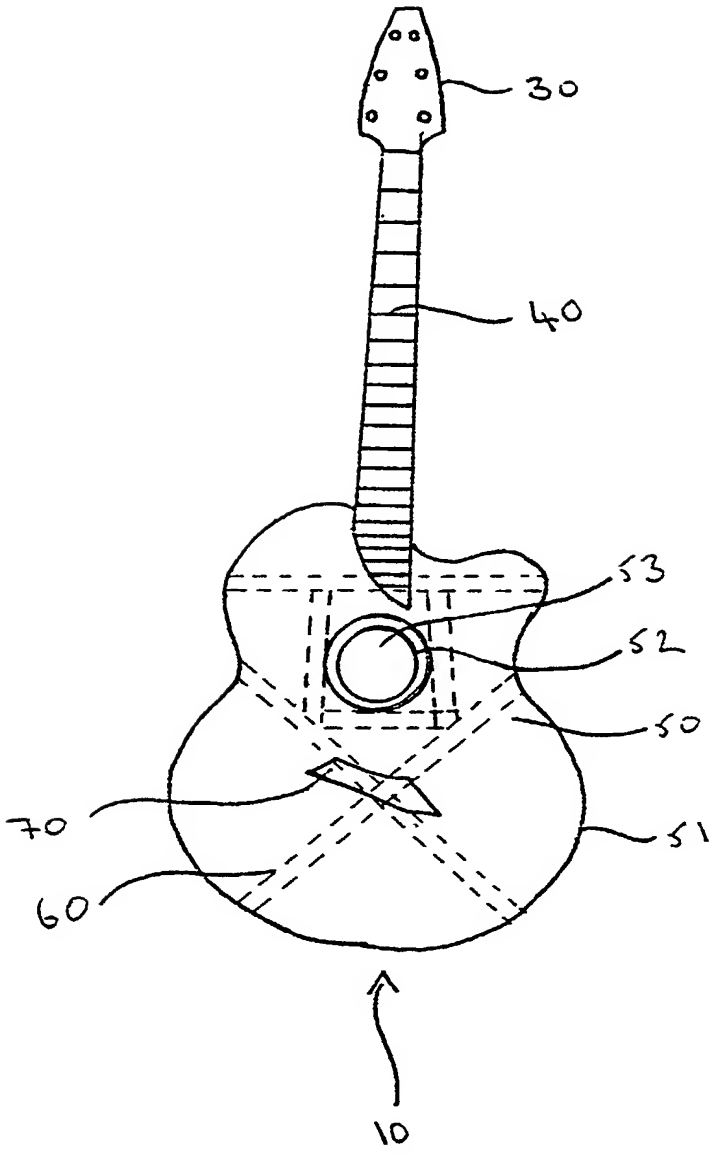

Figure 1

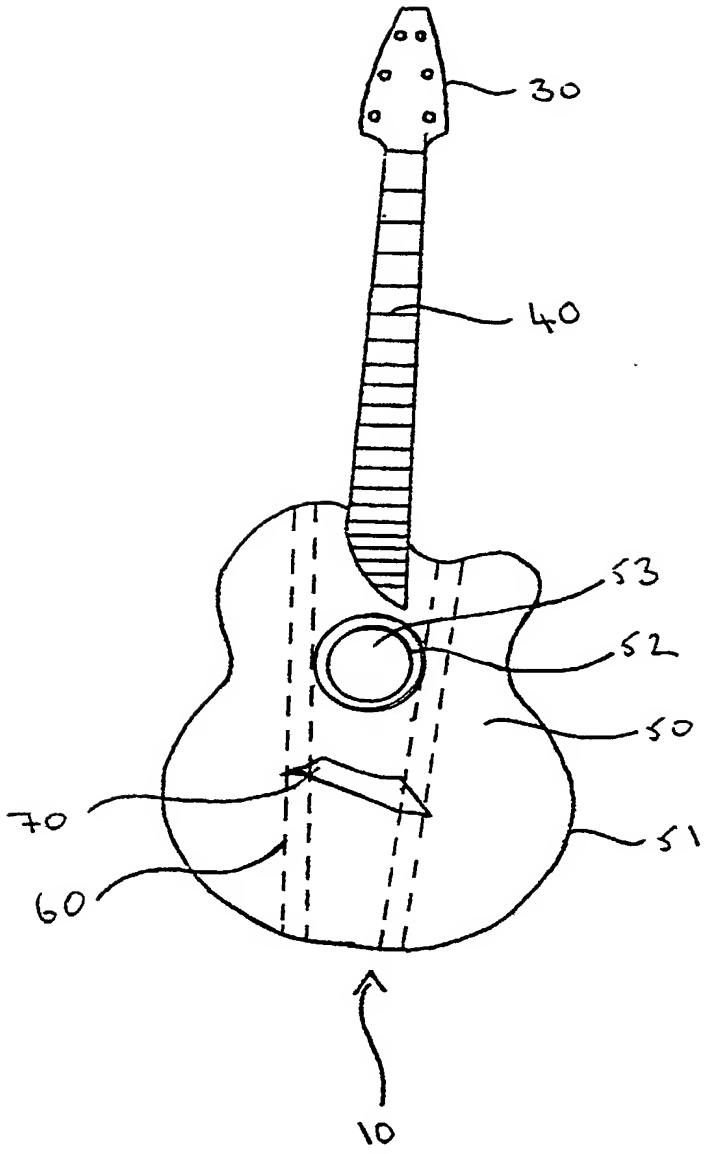

Figure 2

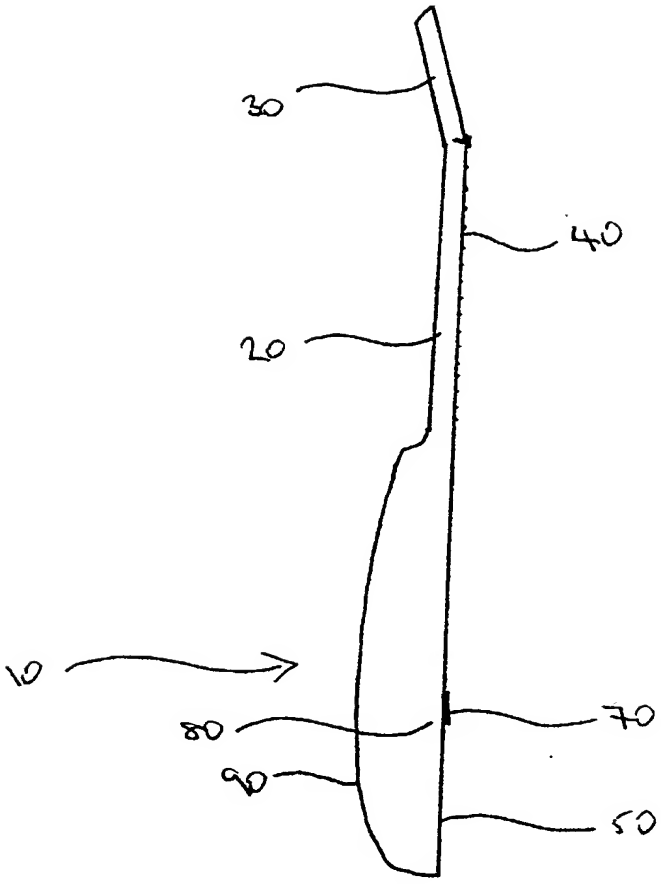

Figure 3

ALL PATENTS, INCLUDING DESIGN
FOR APPLICATION BASED ON PCT; PARIS CONVENTION
NON PRIORITY; OR PROVISIONAL APPLICATIONS

DECLARATION AND POWER OF ATTORNEY U.S.A.

FOR ATTORNEYS' USE ONLY

ATTORNEYS' DOCKET NO

P7575US0

101 / 102

As a below named inventor, I declare that my residence, post office address and citizenship are stated below next to my name, the information given herein is true, that I believe that I am the original first and sole inventor (if only one name is listed at 201 below) or an original, first and joint inventor (if plural inventors are named below at 201-203, or on additional sheets attached hereto) of the subject matter which is claimed and for which patent is sought on the invention entitled

ACOUSTIC DEVICE

which is described and claimed in:

[X] PCT International Application No PCT/GB00/03073 filed 9 August 2000

[ ] the attached specification

[ ] the specification in application Serial No _____ filed _____

(if applicable) and amended on _____

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above
I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1 56
I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed

103 / 104

Prior Foreign Application(s) (Number)	(Country)	(Day/Month/Year Filed)	Priority Claimed
9919922.6	United Kingdom (GB)	24 August 1999	[X] Yes [ ] No
			[ ] Yes [ ] No
			[ ] Yes [ ] No

I hereby claim the benefit under Title 35, United States Code,§119(e) of any United States provisional application(s) listed below

Application No _____ Filing Date _____ Application No _____ Filing Date _____

105

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1 56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status: patented, pending, abandoned)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys (Registration No) to prosecute this application, receive and act on instructions from my agent, and transact all business in the Patent and Trademark Office connected therewith HARVEY B JACOBSON, JR (20,851), JOHN CLARKE HOLMAN (22,769), MARVIN R STERN (20,640); ALLEN S. MELSER (27,215), MICHAEL R. SLOBASKY (26,421), JONATHAN L. SCHERER (29,851), IRWIN M AISENBERG (19,007); WILLIAM E PLAYER (31,409), YOON S. HAM (45,307) and NATHANIEL A. HUMPHRIES (22,772)

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*Inventor(s) name must include at least one unabbreviated first or middle name.

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POST OFFICE ADDRESS	POST OFFICE ADDRESS: 16 Wightman Close, Shepshed	CITY: Leicester, Leicestershire	STATE OR COUNTRY: United Kingdom		ZIP CODE: LE12 9NQ

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under section 1001 of Title 18 of the United States Code; and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon

SIGNATURE OF INVENTOR 201*	SIGNATURE OF INVENTOR 202*	SIGNATURE OF INVENTOR 203*
X	X	X
DATE X 14.02.02	DATE X 20.02.02	DATE X 14.2.02

[ ] Additional inventors are named on separately numbered sheets attached hereto.